

Summary of Mine Reclamation Projects in the Upper Animas River Basin (Updated 11/2/2015)

<u>(1) Project Sponsor</u>	<u>(2) Project Site Name</u>	<u>(3) Location</u>	<u>(4) Type of Remediation</u>	<u>(5) Project Timeframe</u>	<u>(6) Funding (incl. in-kind match)</u>	<u>(7) Improvements (actual or anticipated)</u>
Sunnyside Gold Corp.	Lead Carbonate Millsite	Gladstone on bank of S. Fork of Cement Creek	Removal of 27,000 yards of tailings from streambank	Completed 1991	SGC: \$163,000	Reduce loading of metals and erosion transport of tailings
Sunnyside Gold Corp.	Mayflower Mill – Tailings Ponds #1, #2 and #3	Mayflower Mill complex near Boulder Creek and Animas River	Re-contour inactive tailings ponds and cap. 625,000 yards of tailings and overburden moved.	Completed 1991-1992	SGC: \$1,755,000	Mined land reclamation –reduce loading of metals and erosion transport of tailings
Sunnyside Gold Corp.	Lake Emma Sunnyside Basin	Sunnyside Basin headwaters of Eureka Creek	Fill mine subsidence, remove 240,000 yards mine waste and re-contour disturbances.	Completed 1991-1993	SGC: \$911,000	Mined land reclamation and reduce loading of metals
Sunnyside Gold Corp.	American Tunnel waste dump	Gladstone on bank of S. Fork of Cement Creek	Remove 90,000 yards of waste dump and underlying historic tailings	Completed 1995	SGC: \$766,500	Mined land reclamation and reduce loading of metals and erosion transport of tailings
Sunnyside Gold Corp.	Eureka Townsite	On banks and In floodplain of Animas River	Remove 112,000 yards of tailings	Completed 1996	SGC: \$843,000	Reduce loading of metals and erosion transport of tailings
Sunnyside Gold Corp.	Gladstone	Cement Creek at Gladstone	Divert and treat Cement Creek to mitigate any short term impacts of reclamation projects	8/96-5/99, 11/99-12/99	SGC: \$901,000	Reduce loading to Animas River to offset any short term impacts of reclamation of other sites.
Sunnyside Gold Corp.	Boulder Creek Tailings	Flood plain of Boulder Cr. and the Animas River	Remove 5700 yards of tailings	Completed 1997	SGC: \$32,500	Reduce loading of metals and erosion transport of tailings
Sunnyside Gold Corp.	Ransom adit	Eureka townsite above old mill foundation	Bulkhead seal to stop deep mine drainage and reclaim portal	Completed 1997	SGC: \$85,400	Restore hydrologic regime and reduce rate of ore oxidation by placing mine workings under water to reduce metal loading.
Sunnyside Gold Corp.	Gold Prince mine waste and tailings	Headwaters of Placer Gulch	Bulkhead seals to stop deep mine drainage. Consolidate mine waste and tailings (moved 6000 yards) and construct	Completed 1996-1997	SGC: \$151,000	Reduce exposure to water to reduce metal loading

			upland diversions			
Sunnyside Gold Corp.	Longfellow-Koehler	Headwaters of Mineral Creek near top of Red Mountain Pass	Remove Koehler dump (32,100 yards), consolidate Junction Tunnel dump and Longfellow dump and cap. Capture adit drainages. Construct diversions. Feasibility study of wetland treatment of Koehler drainage.	Completed 1996-1997	SGC: \$580,000	Reduce metal loading and erosion transport of mine waste
Sunnyside Gold Corp.	Pride of the West tailings	Howardsville near confluence of Cunningham Creek with Animas River	Remove 84,000 yards of tailings	Completed 1997	SGC: \$490,500 TUSCO: \$14,000	Reduce metal loading and transport of tailings by erosion
Sunnyside Gold Corp.	Sunnyside Mine	Sunnyside Mine Lake Emma Area	Inject 652 tons of hydrated lime into the Sunnyside Mine pool to provide increased alkalinity and improve initial mine pool conditions	Completed 1996-1997	SGC: \$313,000	Improve initial conditions as water table is restored through bulkheading to stop mine drainage
Sunnyside Gold Corp.	Mayflower Upland Hydrological Control	Mayflower Mill and Tailings Pond #1 area near Silverton	Capture and divert three upland drainages that were going subsurface up-gradient of the mill and TP #1 facilities	Completed 1998-1999	SGC: \$186,000	Minimize potential for contact of runoff with tailings and reduce potential for metal loading
Sunnyside Gold Corp.	TP #4 drainage modification	Drainage ditch between Hwy. 110 and TP #4 near Silverton and Animas R.	Install lined diversion ditch to capture surface runoff and prevent infiltration through tailings material	Completed 1999	SGC: \$72,000	Minimize potential for contact of runoff with tailings and reduce potential for metal loading
Sunnyside Gold Corp.	TP #4 upland groundwater diversion	Up-gradient from Tailings Pond #4 near Silverton	Capture groundwater and divert around tailings impoundment	Completed 1993-1995, 1999	SGC: \$409,000	Minimize potential for contact of groundwater with tailings and reduce potential for metal loading
Sunnyside Gold Corp.	Sunnyside Mine hydraulic seal project	Sunnyside Mine	Bulkhead placement in Sunnyside Mine to restore hydrologic regime to approximate pre-mining and eliminate drainage from adits (6 bulkheads)	Completed 1992-1996	SGC: \$2,346,000	Place mine workings under water to reduce oxidation, restore groundwater movement around mine workings and eliminate need for perpetual water treatment
Sunnyside Gold Corp.	Power Plant Flats	Power Plant Flats, Animas River floodplain	Removal of mill tailings from floodplain	Completed 2003	SGC: \$?	Excavate buried tailings and dispose into Mayflower Tailings Pond #4
Gold King	Mogul Mine	Mogul Mine,	Stop discharge of AMD from	Summer,	SGC: \$?	Reduce metal loading to Upper

Mines Corp.		Upper Cement Crk.				
Gold King Mines Corp.	Kohler Mine Bulkhead	Kohler Mine, Headwaters of Mineral Crk	Stop discharge of AMD from Kohler mine	Summer, 2003	SGC: \$	Reduce metal loading to Mineral Crk. Headwaters
Gold King Mines Corp	Gold King Mine	Gladstone, N. Fork of Cement Creek	Hydrologic controls for workings and mine waste	1998	Gold King: \$117,300	Reduce metal loading to North Fork of Cement Creek
Gold King Mines Corp	Gold King Mine discharge	Gold King discharge treatment	Pipe mine discharge to Gladstone to actively treat	2002	Gold King: \$?	Reduce metal loading to Upper Cement Crk.
Silver Wing Mining Co	Silver Wing	Animas river, about 1.5 mile above Eureka	Collect AMD, hydrological controls	1995	Silver Wing \$7,000	Remove AMD from dump, reduce metals loading
Silver Wing Mining Co	Silver Wing	Animas River, about 1.5 miles above Eureka	Anoxic Drain, settling pond, bioreactor	1999-2000	NPS 319 Funds: \$216,000. St. Severance tax: \$144,000	Reduce metal loading to the Animas River.
Anglo Saxon, Inc	Anglo Saxon/Porcupine Mines	Cement Creek	Determine water pressure behind 2 closed portals	2009	\$14,000 NPS \$10,000 Anglo Saxon, Inc.	Characterization for evaluation of bulkheads in mines
Mining Remedial Recovery	Sunbank Group	Placer Gulch	Anoxic drain, settling pond, waste consolidation, bulkhead	1995	NPS 319 Funds: \$58,000 MRRC: 38,500	Raise pH from draining adit, reduce metal loading from adits and mine waste
Salem Minerals	Mammoth Tunnel	North Fork of Cement Creek	Settling ponds for mine drainage	1999	NPS 319 Funds: \$10,050. Salem Minerals: \$6,700	Focused on reductions of iron to Cement Creek
San Juan RC & D (ARSG)	Carbon Lakes Mine Dump	Headwaters of Mineral Creek East of Red Mountain Pass	Removal of 1,900 cubic yards of waste rock from stream channel	Phase 1 –completed 1999	NPS 319 Funds: \$72,000 ARSG match: \$62,800	Reduce loading of metals especially Cadmium, Copper, Iron, Lead, Manganese, and Zinc
San Juan RC&D (ARSG)	Galena Queen and Hercules	Prospect Gulch	Waste Removal, hydrologic controls, amendments, revegetation.	2001	NPS 319 Funds: \$94,800 Mineral Sev: \$90,000	Elimination of surface water leaching of toxic metals. Post remediation monitoring begins in 2002.
San Juan RC & D	Carbon Lakes Mine	Headwaters of Mineral Creek	Complete removal of waste rock from stream channel	2001 season	NPS 319 Funds: \$38,000	Reduce loading of metals to Animas River, restore stream channel,

(ARSG)	Waste Phase II Part 1	East of Red Mountain Pass			ARSG Match: \$51,000	
San Juan RC & D (ARSG)	Carbon Lakes Phase II, Part 1	Headwaters of Mineral Creek East of Red Mountain Pass	Removal and disposal of 3000 tons of <u>Congress Mine Dump</u> wastes	2001 season	NPS 319 Funds: \$38,500 ARSG Match: \$42,500	Reduce loading of metals to Animas River by beginning the removal of mine wastes.
San Juan RC & D (ARSG)	Carbon Lakes Phase II, Part 2	San Antonio & Kohler Tunnel infiltration control	Infiltration Control: Purchased Carbon Lakes Trans-basin diversion rights; abandoned ditch	2001 season	NPS 319 Funds: \$50,000 ARSG Match: \$33,333	Reduce water infiltration to the San Antonio and Koehler Mines; reduce AMD
San Juan RC & D (ARSG)	Red Mtn. Project	Carbon Lakes Ditch Restoration	Ditch, Wetland and Stream Restoration	2003	SWWCD: \$5,000; USFS: \$12,400	Return Mineral Crk headwaters to natural hydrology; erosion controls; restoration of transbasin diversion ditch; wetland restoration.
San Juan RC & D (ARSG)	Red Mtn. Project	Congress Mine, Mineral Crk. headwaters	Complete removal of Congress mine wastes	2003	NPS 319: \$174,000; July, 2003; Min. Severance Tax: \$?	Reduce metal loading to Animas River by removal of mine wastes and benefaction.
San Juan RC & D (ARSG)	Red Mtn. Project	San Antonio Mine Waste Control project	Hydrological controls, remove wastes from stream, consolidation, neutralization, revegetation	2004	Ca. \$80,000; 40% match from Silver Wing Co. disposal fees.	Reduce metal loading and acidity to Mineral Creek; stabilize site, restore streambed
San Juan RC & D (ARSG)	Handies Peak Project	Lucky Jack Mine wastes and drainage	Hydrological controls, remove wastes from fen, consolidation, neutralization, revegetation; adit and shaft closures	2004	Ca. \$75,000; match from Co. Mineral Severance	Reduce metal loading and acidity to Upper Animas River; uncover fen and restore
San Juan RC & D (ARSG)	Handies Peak Project	Upper Lucky Jack Mine wastes and drainage	Consolidation, neutralization, & revegetation of waste dump; clean streambed of wastes	2005	Ca. \$13,095; match from Co. Mineral Severance	Reduce metal loading and acidity to Upper Animas River from leaching mine wastes partially residing in stream
San Juan RC & D (ARSG)	Infiltration Control Project	Pride of the West Mine Open Stopes	Combined safety and infiltration closure of 2 large open stopes & 1 raise.	2005	Ca 700,000; Min. Severance; NPS = \$125K; Match=\$84K	Reduced surface water infiltration into mine to reduce metal loading at mine discharge.
San Juan RC & D (ARSG)	Priority Waste Site	Kansas City #1, 2, and 3 mines	Safety closure, mine waste consolidation and burial; revegetation; run-on/off controls.	2006	Ca 175,000; Mineral Severance, NPS, DMG safety pro	Reduced surface water leaching of mine wastes.
San Juan	Red Mtn.	Upper Browns	mine waste consolidation and	2006	\$62,000 NPS	Reduced surface water leaching of

RC & D (ARSG)			burial; revegetation; run-on/off controls.			
San Juan RC & D (ARSG)	Silver Ledge Project	Mineral Creek	Remove mine wastes from creek, consolidation in repository; fly ash; run on and run-off controls, some reveg.	2010	\$104,486.92 (40% DRMS Match)	Reduced surface water leaching of mine wastes
San Juan RC & D (ARSG)	Koehler Mine fracture grouting	Mineral Creek	Install new portal, rehabilitate mine drift	2010	\$47,044.00 (40% DRMS Match)	n/a
San Juan RC & D (ARSG)	Koehler Mine fracture grouting	Mineral Creek	Pressure grout fractures around existing bulkhead	2011	\$337,135.00 (40% DRMS Match)	Reduce metal loading to Mineral Creek
San Juan RC & D (ARSG)	ARSG 319 Maintenance and Characterizat ion Project	Mineral Creek, Carbon Lakes, San Antonio, Congress and Silver Ledge	Maintenance of previous 319 mine sites, revegetation at Carbon Lakes and Congress, and maintenance of repository at Silver Ledge	2013	\$147,107.39 - All Power Authority CDPHE funds	Maintenance of repositories and removal sites that are reducing surface water leaching of mine wastes
San Juan RC & D (ARSG)	Bullion King Mine Waste Reclamation Project	Mineral Creek	mine waste consolidation and burial, liners; revegetation; run-on/off controls.	2015	\$443,621.42 (40% DRMS match)	Reduced surface water leaching of mine wastes.
Office of Surface Mining	Galena Queen	Prospect Gulch	Waste consolidation & hydrological controls	1998	Office of Surface Mining: \$10,000	Reduce surface water leaching of toxic metals
U.S. BLM	Joe & John Tunnel	Prospect Gulch	Mine drainage collection and diversion	1998-1999	BLM: \$36,000	Collect AMD for later treatment project development
U.S. BLM	Lark Mine	Prospect Gulch	AMD collection, hydrological controls	1999	BLM: \$17,800	Collect AMD for possible treatment, remove surface water from site
U.S. BLM	Forest Queen	Animas near Eureka	AMD collection and passive wetland treatment	1998-1999	BLM: \$290,000	Reduce metal loading to Animas River
U.S. BLM	Mayday Mine	Cement Creek	Hydrological controls, cap top of mine waste pile Repairs to wall and cap	1998-1999 2011	BLM: \$87,000 BLM \$135,670	Reduce surface water leaching of toxic metals
U.S. BLM	Lackawanna Tailings	Animas near Silverton	Removal of tailings from flood plain to Mayday dump for consolidation and capping.	2000	BLM: \$300,000	Reduce metal loading to Animas River
U.S.BLM	Elk Tunnel	Cement Crk	Passive treatment of mine discharge	2003	BLM: \$110,000	Reduce Fe loading to Cement Crk
U.S.BLM	Henrietta	Prospect Gulch	Mine waste consolidation,	2004	Duke Energy,	Reduce metals and acidity in

& Duke Energy	Mine 6 & 7 levels		neutralization, clay cap, top soil, revegetation		\$500,000; BLM \$unknow	
U.S.BLM	Upper Joe & John & Lark mines	Prospect Gulch	Consolidation of mine wastes from 2 mines sites into one lined repository Repository Repairs	2006-7 2011	BLM: >\$600,000 \$24,700	Reduce Fe, Zn, Cu, Cd, Pb loading to Cement Crk
U.S.BLM	Lark	Prospect Gulch	Repair damages to access road	2010		
U.S.BLM	Wynona	Cement Creek	Construct 0 valent iron treatment system; road access	2010	BLM \$110,103	Test treatment media and reduce metal loading to Cement Creek
U.S.BLM	Lark	Prospect Gulch	Repair repository migrating cover; reveg.	2011		
U.S.BLM	Wynona	Cement Creek	Test water treatment media Remove failed media; replace	2010 2011	BLM \$110,103 BLM \$8,300 + to MSI \$4972	Test treatment media and reduce metal loading to Cement Creek
U.S.F.S.	Bonner Mine	Middle Fork of Mineral Creek	Waste removal and consolidation; capture mine drainage and reroute	2000	F.S.: \$63,384	Reduce metal loading of N. Fork Mineral Creek from mine waste and draining adit
U.S.F.S.	Brooklyn Mine	Browns Gulch – tributary of Mineral Creek	Mine waste removal and disposal in pit w/impervious cap.	2004	F.S.: \$800,000	Reduce metal and acidity from leaching into Mineral Creek.
U.S.F.S.	Bonner Mine	Middle Fork of Mineral Creek	Small scale test of biochar for metals removal of AMD	2011	F.S. \$? MSI \$?	
U.S. EPA	Red & Bonita	Cement Creek	Opened up and explored mine workings Installed Bulkhead	2011-2013 2015	EPA: \$300,000 \$800,000	Removed blockage and secured mine entrance. Explored for remediation. Installed bulkhead
U.S. EPA	Gold King	Cement Creek	Piped discharge to Gladstone for treatment	2015	EPA: \$1.5 million installation; \$16,000/week operation	95% reduction in metal loading from Gold King Mine. Treating approx. 550 gpm